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for chemical study, but the discoverer of the spectroscope was almost forgotten. A few brief years passed by, and as the light of the brilliant meteor is suddenly extinguished, so Victor Meyer was no more. But still Bunsen lingered, as if loath that a single year of the century ushered in by his master Wöhler should be left without the presence of one of the giant minds of chemistry. But now he too is gone and the last link between the past and the present is severed as far as lives go; but upon the foundations laid by Bunsen many a superstructure will continue to rest, and yet many another building will be erected.

JAS. LEWIS HOWE.

WASHINGTON AND LEE UNIVERSITY.

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*SCIENTIFIC BOOKS.*

*Anatomie des Frosches auf Grund eigener Untersuchungen.* By A. ECKER und R. WIEDERSHEIM, durchaus neu bearbeitet von DR. ERNST GAUPP. Zweite Abteilung, Zweite Hälfte. Lehre vom Gefäßsystem. Braunschweig, 1899, pp. XII. and 237-548.

Some time ago (this JOURNAL, Vol. VII., p. 463) we had occasion to notice the first and second parts of Gaupp's edition of Ecker on the frog, and now the third part of the same work lies before us. This part is devoted solely to the anatomy of the vascular system and here, as in the sections devoted to the skeleton, muscles and nerves, we find what is practically a new treatment, and not merely a revision of an old work. Not only has every page been rewritten, but every illustration has been redrawn, and most of them are printed in colors, adding not a little to the clearness.

It is impossible to summarize these 312 pages nor to point out what is new in them, for that would require more space than we can give. As one would naturally expect, the additions and changes are less in the parts relating to the arteries and veins, but even here they are numerous. The heart is described with far more accuracy and detail than ever before. It is, however, in the lymph system that the changes are the greatest. In fact, this section is almost

wholly a new investigation. In the former editions there was a brief account of the lymph-hearts and of some of the sub-cutaneous lymph-sacs and that was all. Dr. Gaupp has studied not only all of these (he has added four sub-cutaneous lymph sacs not recognized before), but he has described with the greatest detail the lymph spaces which are scattered through the body and has made out the openings by which they communicate with one another.

As we turn over the pages of the work we wonder what the technique has been and many may be glad to learn his methods. For injections of the arterial system he found that shellac solutions were most useful, while for the venous system he depended largely upon natural injections, the blood settling in these vessels. To aid in this the animals were hung in various positions so that the blood might flow into the various portions. Then a transfer to formalin produced coagulation. A similar coagulation of the lymph as well as the well-known method of inflation with air aided in the demonstration of the lymph sacs and spaces; while the communications between these (minute openings in the thin and almost transparent membranes) were rendered visible by means of absolute alcohol and weak solutions of iodine.

In conclusion we may say that we have only praise for this part of the work, and that, while in a few places we find differences from conditions which occur in our American frogs, we find nothing that we can regard as serious errors. The probabilities are that it will never be translated, but it is a treatise which should be on the shelves of every laboratory. The clear and simple German in which it is written will make its contents easily accessible to the great majority of our college students. The concluding part dealing with the viscera, integument and sense organs, is promised shortly.

J. S. KINGSLEY.

*The Fixation, Staining and Structure of Protoplasm, a Critical Consideration of the Theory and Technique of Modern Cell-study.* By DR. ALFRED FISCHER (Leipsic), royal octavo, 362 pages, 1 double plate and 21 figures in text. Published by G. Fischer, Jena, 1899.

The history of the closing cycle of botanical

activity will undoubtedly show that one of its most noticeable and unusual features has been the enormous amount of energy devoted to the study of the structure of protoplasm. Research in this phase of biological science may be said to have had its origin chiefly in an effort to determine the mechanism of the nucleus as a vehicle of heredity, and it has been directed for the greater part to the morphology of the chromatin in mitotic division, and to the behavior of the 'attractive and directive bodies,' with some effort to take into consideration the structure of protoplasm and the general organization of the cell. The results of these investigations have filled a great amount of space in all classes of botanical Journals, beside the special periodicals devoted to the subject, and have covered an untold area of the costliest plates. The early specialization of a large number of the younger workers in this line has led to the publication of many articles on the subject utterly devoid of literary form, filled with local and personal terms, uselessly recounting technique, and giving the most merciless repetition of details of observation with no attempt to summarize the results, or give the general significance of the phenomena described: making the preparation of such a work as the book under discussion doubly necessary.

Then again the time seems at hand when the cytologist may be fairly asked to interpret to his botanical brethren the vast amount of detail accumulated in the last decade by his method of research. So far as the general discussions of recent date may be taken as a reply to this pertinent inquiry, the summary of well-grounded facts and established theory shows a very small residuum of actual progress. Thus one of the most prominent cytologists in America has taken occasion to say, in a recent review of knowledge of the cell, "And yet if we take account of the actual knowledge gained, we can not repress a certain sense of disappointment, partly that microscopical research should have fallen so far short of giving the insight for which we had hoped, but still more because of the failure of the best observers to reach any unanimity in the interpretation of what is actually visible under the microscope. \* \* \* I would like at the outset to express the

opinion that, if we except certain highly specialized structures, the hope of finding in visible protoplasmic structure any approach to an understanding of its physiological activity is growing more, instead of less remote, and is giving way to a conviction that the way of progress lies rather in an appeal to the ultra-microscopical protoplasmic organization, and to the chemical processes through which this is expressed." (E. B. Wilson, in SCIENCE, p. 34, July 14, 1899.)

The chief value of the book at hand consists in its collation of the methods used, and facilitates the ready selection of those which give promise of results in new methods of attack.

In Part I. the reaction of the more important chemical constituents of the cell to fixing agents is discussed, and the principles evolved must be considered as valuable when used as a means of chemical analysis of the cell. Part II. takes up in detail the methods and theory of staining. Chromatin is defined as the substance which contains nucleic acid and which as the acid content increases, stains less deeply with watery solutions of acid colors, and methyl green is designated as the only basic stain for nuclear substance. The chapters on this subject should do much to give a more intelligent development of the technique of staining, though it is to be feared that such terms as 'acidiphobie,' 'basiphobie,' 'eosinophilie' and 'fuchsinophilie' will be transplanted bodily into the English text by that class of workers who seem unequal to the translation of new terms, or the suppression of those unnecessary to the real advance of the subject. Astral rays and polar spindles come in for their share of attention in Part III., the chief methods of forming artificial radiating processes are given. The discussion of the histology and development of these structures is notable for its omissions, which are further reflected in the bibliographical list. The consideration given centrosomes illustrates quite clearly the fragmentary and contradictory state of our information concerning the morphology and physiology of these bodies.

The concluding part of the work is taken up with a consideration of the various theories as to the structure of protoplasm, an adduction of the views of most of the principal workers, and

the description of the experiments for the production of artificial protoplastic formations.

It is to be said that this book of Dr. Fischer's comes most timely to aid the beginner, or the worker in other lines of investigation to orient the vast body of detail which has been presented in such confusion during the last decade, and it may also do much to put research upon the included subjects on a more rational basis.

D. T. MACDOUGAL.

NEW YORK BOTANICAL GARDEN.

*A Class-book of (Elementary) Practical Physiology.*

By DE BURGH BIRCH, Professor of Physiology in the Yorkshire College of the Victoria University. Philadelphia, P. Blakiston's Son & Co., 1899. Pp. xii + 273.

This book is one of that considerable class of laboratory guides which are prepared for individual laboratories. While fairly good of its kind, it cannot readily be adapted to general use. This is more particularly true of the experimental section, where the directions to the student frequently have reference to specific appliances which, in the form here described, are not to be found in physiological laboratories generally. The course outlined is that which is so commonly denominated Physiology in the British colleges, and consists of histological, chemical and experimental sections. The first section comprises 117 pages, the second 61, and the third 87. The method employed is that of supplying the student with detailed directions, leaving comparatively little opportunity for the play of his ingenuity. This method, while making instruction easy for the instructor, does not develop the student. It is carried to its extreme in dealing with the direct method of using the ophthalmoscope: "First, with the apertures closed, endeavor to look into the eye through the lens, moving your eye and a light in all directions to do so. You will not succeed." If success is impossible, why deliberately guide the student in that direction?

Not a large amount of ground is covered by the book. The subjects and experiments that are presented are the conventional ones, and the work is intelligently done. The book, however, hardly seems to be called for outside the author's own laboratory. FREDERIC S. LEE.

COLUMBIA UNIVERSITY.

*Elementary Physiology.* By BENJAMIN MOORE, M.A., Professor of Physiology in the Medical Department of Yale University. New York, Longmans, Green & Co., 1899. Pp. viii + 295.

The majority of the briefer text-books of physiology are not written by physiologists. They are the work of men who rely upon larger text-books for their knowledge, and whose motive too often is the money to be obtained from the text-book mongers. Too many of these authors are willing, for a consideration, to prostitute the science for commercial purposes, and to write it down to the level of those who appear to believe that an account of the working of the human body, and a description of the awfulness of a drunkard's life, are synonymous. It is a relief and pleasure to turn from such machine-made books to such a one as Professor Moore's, and to feel the loving interest that every page of the book reveals. One can forgive the occasional lapses from strict rhetorical usage, the not infrequent long sentences, and the rather indiscriminate and often misleading use of commas, when one realizes that the author knows his subject and writes entertainingly of it.

The book is devoted to the physiology of man and those animals that are allied to man, and in less than three hundred pages there is given a concise and very readable outline of the subject, an appendix of practical exercises and a set of test questions. The trend of the author as a physiologist is evidenced by the fact that nearly one-half of the book is devoted to nutrition, including the blood and its circulation, digestion, absorption, metabolism, respiration, excretion and animal heat. In an unprejudiced division of the subject of human physiology, this seems too large a proportion, although it must be granted that the account of these processes is an admirable one. Forty-three pages seem also too large a share to give to the skeleton and its articulations. In general, the amount of anatomy may be criticised as excessive; but throughout this the author keeps in mind the subject of function and thus illuminates his descriptions of structure. Furthermore, one-sixth of the whole space is a small proportion to devote to the nervous sys-